

# PATENT APPLICATION TRANSMITTAL LETTER

(Small Entity)

Docket No.

0114-00004

## TO THE ASSISTANT COMMISSIONER FOR PATENTS

Transmitted herewith for filing under 35 U.S.C. 111 and 37 C.F.R. 1.53 is the patent application of:

Ronald Thomas

For: Automated Pin For Gas Assisted Injection Molding System

Enclosed are:

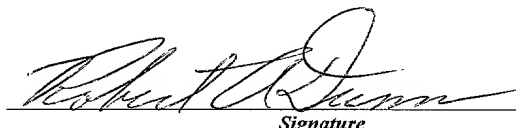
- ☒ Certificate of Mailing with Express Mail Mailing Label No. **EL533059118US**
- ☒ **One** sheets of drawings.
- ☐ A certified copy of a application.
- ☒ Declaration ☐ Signed. ☒ Unsigned.
- ☒ Power of Attorney
- ☐ Information Disclosure Statement
- ☐ Preliminary Amendment
- ☒ **One** Verified Statement(s) to Establish Small Entity Status Under 37 C.F.R. 1.9 and 1.27.
- ☐ Other:

### CLAIMS AS FILED

For	#Filed	#Allowed	#Extra	Rate	Fee
Total Claims	12	- 20 =	0	x \$9.00	\$0.00
Indep. Claims	2	- 3 =	0	x \$39.00	\$0.00
Multiple Dependent Claims (check if applicable) <input type="checkbox"/>					\$0.00
BASIC FEE					\$345.00
TOTAL FILING FEE					\$345.00

- ☒ A check in the amount of **\$345.00** to cover the filing fee is enclosed.
- ☒ The Commissioner is hereby authorized to charge and credit Deposit Account No. **04-1131** as described below. A duplicate copy of this sheet is enclosed.
  - ☐ Charge the amount of as filing fee.
  - ☒ Credit any overpayment.
  - ☒ Charge any additional filing fees required under 37 C.F.R. 1.16 and 1.17.
  - ☐ Charge the issue fee set in 37 C.F.R. 1.18 at the mailing of the Notice of Allowance, pursuant to 37 C.F.R. 1.311(b).

Dated: 4/21/00

  
Signature

Robert A. Dunn (Reg. No. 30,556)  
Dinnin & Dunn, P.C.  
755 West Big Beaver, Ste. 2100  
Troy, MI 48084  
(248) 362-2800

cc:

**CONTINUED PROSECUTION APPLICATION (CPA)  
REQUEST TRANSMITTAL (Small Entity)**

Submit an original, and a duplicate for fee processing.

(Only for Continuation or Divisional Applications Under 37 CFR 1.53(d))

Docket No.

0114-00004

☐ **DUPLICATE** (Check box  
if applicable)

First Named Inventor

Examiner

Group/Art Unit

Ronald Thomas

## Address to:

Assistant Commissioner for Patents

Box CPA

Washington, D.C. 20231

This is a request for filing a ☒ continuation or ☐ divisional application under 37 CFR 1.53(d), (continued prosecution application (CPA)) of prior application number 60/130,835 filed on 4/22/99 and entitled:

**Automated Pin For Gas Assisted Injection Molding System**

1. ☐ Enter the unentered amendment previously filed on \_\_\_\_\_ under 37 CFR 1.116 in the prior nonprovisional application.
2. ☐ A preliminary amendment is enclosed.
3. ☐ This application is being filed by fewer than all the inventors named in the prior application, 37 CFR 1.53(d)(4).
- a. ☐ **DELETE** the following inventor(s) named in the prior nonprovisional application:
- b. ☐ The inventor(s) to be deleted are set forth on a separate sheet attached hereto.
4. ☒ A new power of attorney or authorization of agent is enclosed.
5. ☒ Small Entity Status:
- a. ☒ A small entity statement is enclosed.
- b. ☐ A small entity statement was filed in the prior nonprovisional application and such status is still proper and desired.
6. ☐ The fee for this application is calculated as follows:

**CLAIMS AS FILED**

For	#Filed	#Allowed	#Extra	Rate	Fee
Total Claims	10	- 20 =	0	x \$9.00	\$0.00
Indep. Claims	2	- 3 =	0	x \$39.00	\$0.00
Multiple Dependent Claims (check if applicable) <input type="checkbox"/>					\$0.00
BASIC FEE					\$345.00
TOTAL FILING FEE					\$345.00

**CONTINUED PROSECUTION APPLICATION (CPA) REQUEST TRANSMITTAL (Small Entity)**  
**(Only for Continuation or Divisional Applications Under 37 CFR 1.53(d))**

7. ☒ The Commissioner is hereby authorized to credit overpayments or charge the following fees to  
Deposit Account No. 04-1131

- ☒ fees required under 37 C.F.R. 1.16.
- ☒ fees required under 37 C.F.R. 1.17.
- ☒ fees required under 37 C.F.R. 1.18.

8. ☒ A check in the amount of \$345.00 is enclosed.

9. ☐ An Information Disclosure Statement (IDS) is enclosed:

- a. ☐ PTO-1449
- b. ☐ Copies of IDS Citations

10. ☒ Also enclosed:

**Declaration and Power of Attorney//Signed Verified Statement Claiming Small Entity Status//Drawings**

11. ☒ The prior application's correspondence address will carry over to this CPA UNLESS a new correspondence address is provided below:

**Robert A. Dunn (Reg. No. 30,556)**  
**Dinnin & Dunn, P.C.**  
**755 West Big Beaver, Ste. 2100**  
**Troy, MI 48084**

CONTINUED PROSECUTION APPLICATION (CPA) REQUEST TRANSMITTAL (Small Entity)  
(Only for Continuation or Divisional Applications Under 37 CFR 1.53(d))

**NOTES**

**Submit an original, and a duplicate for fee processing.**

**FILING QUALIFICATIONS:** The prior application must be a nonprovisional application that is either: (1) complete as defined by 37 C.F.R. 1.51(b), or (2) the national stage of an international application in compliance with 35 U.S.C. 371. A Notice will be placed on a patent issuing from a CPA, except for reissues and designs, to the effect that the patent issued on a CPA and is subject to the twenty-year patent term provisions of 35 USC 154(a)(2). Therefore, the prior application of a CPA may have been filed before, on or after June 8, 1995.

**C-I-P NOT PERMITTED:** A continuation-in-part application cannot be filed as a CPA under 37 C.F.R. 1.53(d), but must be filed under 37 C.F.R. 1.53(b).

**EXPRESS ABANDONMENT OF PRIOR APPLICATION:** The filing of this CPA is a request to expressly abandon the prior application as of the filing date of the request for a CPA. 37 C.F.R. 1.53(b) must be used to file a continuation, divisional or continuation-in-part of an application that is not to be abandoned.

**ACCESS TO PRIOR APPLICATION:** The filing of this CPA will be construed to include a waiver of confidentiality by the Applicant under 35 U.S.C. 122 to the extent that any member of the public who is entitled under the provisions of 37 C.F.R. 1.14 to access to, copies of, or information concerning, the prior application may be given similar access to, copies of, or similar information concerning, the other application or application in the file jacket.

**35 U.S.C. 120 STATEMENT:** In a CPA, no reference to the prior application is needed in the first sentence of the specification and none should be submitted. If a sentence referencing the prior application is submitted, it will not be entered. A request for a CPA is the specific reference required by 35 U.S.C. 120 and to every application assigned the application number identified in such request, 37 C.F.R. 1.78(a).

Dated: 4/21/00

  
Signature

Robert A. Dunn

Typed or printed name

30,556

Registration Number (if applicable)

- ☐ Inventor(s)  
☐ Assignee of complete interest  
☒ Attorney or agent of record

cc:

**VERIFIED STATEMENT (DECLARATION) CLAIMING SMALL ENTITY  
STATUS (37 CFR 1.9(f) AND 1.27 (b)) - INDEPENDENT INVENTOR**

Docket No.  
0114-00004

Serial No.

60/130,835

Filing Date

4/22/99

Patent No.

Issue Date

Applicant/ **Ronald Thomas**  
Patentee:

Invention: **Automated Pin For Gas Assisted Injection Molding System**

As a below named inventor, I hereby declare that I qualify as an independent inventor as defined in 37 CFR 1.9(c) for purposes of paying reduced fees under section 41(a) and (b) of Title 35, United States Code, to the Patent and Trademark Office with regard to the invention entitled above and described in:

- ☒ the specification to be filed herewith.  
☐ the application identified above.  
☐ the patent identified above.

I have not assigned, granted, conveyed or licensed and am under no obligation under contract or law to assign, grant, convey or license, any rights in the invention to any person who could not be classified as an independent inventor under 37 CFR 1.9(c) if that person had made the invention, or to any concern which would not qualify as a small business concern under 37 CFR 1.9(d) or a nonprofit organization under 37 CFR 1.9(e).

Each person, concern or organization to which I have assigned, granted, conveyed, or licensed or am under an obligation under contract or law to assign, grant, convey, or license any rights in the invention is listed below:

- ☒ No such person, concern or organization exists.  
☐ Each such person, concern or organization is listed below.

\*NOTE: Separate verified statements are required from each named person, concern or organization having rights to the invention averring to their status as small entities (37 CFR 1.27)

FULL NAME

ADDRESS

☐ Individual☐ Small Business Concern☐ Nonprofit Organization

FULL NAME

ADDRESS

☐ Individual☐ Small Business Concern☐ Nonprofit Organization

FULL NAME

ADDRESS

☐ Individual☐ Small Business Concern☐ Nonprofit Organization

FULL NAME

ADDRESS

☐ Individual☐ Small Business Concern☐ Nonprofit Organization

I acknowledge the duty to file, in this application or patent, notification of any change in status resulting in loss of entitlement to small entity status prior to paying, or at the time of paying, the earliest of the issue fee or any maintenance fee due after the date on which status as a small entity is no longer appropriate. (37 CFR 1.28(b))

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application, any patent issuing thereon, or any patent to which this verified statement is directed.

NAME OF INVENTOR Ronald Thomas

SIGNATURE OF INVENTOR *Ronald H. Thomas*

DATE:

4-5-99

NAME OF INVENTOR \_\_\_\_\_

SIGNATURE OF INVENTOR \_\_\_\_\_

DATE: \_\_\_\_\_

NAME OF INVENTOR \_\_\_\_\_

SIGNATURE OF INVENTOR \_\_\_\_\_

DATE: \_\_\_\_\_

NAME OF INVENTOR \_\_\_\_\_

SIGNATURE OF INVENTOR \_\_\_\_\_

DATE: \_\_\_\_\_

NAME OF INVENTOR \_\_\_\_\_

SIGNATURE OF INVENTOR \_\_\_\_\_

DATE: \_\_\_\_\_

NAME OF INVENTOR \_\_\_\_\_

SIGNATURE OF INVENTOR \_\_\_\_\_

DATE: \_\_\_\_\_

NAME OF INVENTOR \_\_\_\_\_

SIGNATURE OF INVENTOR \_\_\_\_\_

DATE: \_\_\_\_\_

NAME OF INVENTOR \_\_\_\_\_

SIGNATURE OF INVENTOR \_\_\_\_\_

DATE: \_\_\_\_\_

NAME OF INVENTOR \_\_\_\_\_

SIGNATURE OF INVENTOR \_\_\_\_\_

DATE: \_\_\_\_\_

NAME OF INVENTOR \_\_\_\_\_

SIGNATURE OF INVENTOR \_\_\_\_\_

DATE: \_\_\_\_\_

04-24-00

A

04/21/00

U.S. PTO

## CERTIFICATE OF MAILING BY "EXPRESS MAIL" (37 CFR 1.10)

Applicant(s): Ronald Thomas

Docket No.

0114-00004

Serial No.

Filing Date

Examiner

Group Art Unit

Invention: Automated Pin For Gas Assisted Injection Molding System

jc530 U.S. PTO  
09/553807  
04/21/00

I hereby certify that this Continued Patent Application//Drawings//Check

(Identify type of correspondence)

is being deposited with the United States Postal Service "Express Mail Post Office to Addressee" service under  
37 CFR 1.10 in an envelope addressed to: The Commissioner of Patents and Trademarks, Washington, D.C.

20231-0001 on 4/21/00  
(Date)

Michelle Keydel

(Typed or Printed Name of Person Mailing Correspondence)

Michelle Keydel  
(Signature of Person Mailing Correspondence)

EL533059118US

("Express Mail" Mailing Label Number)

Note: Each paper must have its own certificate of mailing.

007240" 408E5540

Please date stamp and acknowledge receipt of the following:

Certificate of Mailing by Express Mail//Patent Application Transmittal Letter//Continued Prosecution Application Request Transmittal Letter//Patent Application//Signed Verified Statement Claiming Small Entity Status//Declaration and Power of Attorney (unsigned)//Check in the amount of \$345.00 (Check No. 13772) mailed on April 21, 2000 via Express Mail EL533059118US

Alliance Gas Systems

Attorney: RAD

Attorney Docket No: 0114-00004

Title: Automated Pin For Gas Assisted Injection Molding

CIP of Serial No: 60/130,835

Filed: 4/22/99





# **AUTOMATED PIN FOR GAS ASSISTED INJECTION MOLDING SYSTEM**

## **Background of the Invention**

Gas assisted injection molding of plastic has long been known in the industry. During gas assisted injection molding molten plastic is forced into an enclosed mold, and gas is injected into the mold within the plastic material. The gas will raise the internal mold pressure and create an expanding gas pocket which will force the cooling plastic to the extreme recesses of the mold, yielding a better fill-out of the mold surface and reducing the sag of the plastic from the mold surface as the plastic shrinks during cooling, thus producing a better finish surface.

There are two main methods of injecting gas into the mold cavity, the first is directly injecting the gas into the mold cavity, known as in article, the second is injecting the gas into a channel leading into the mold, which is known as in-runner. The injection of the gas remotely into the cavity is generally preferred over the channel method.

Nozzles for use in-article or in-runner remote gas injection devices are subjected to packing by the molten plastic injected into the mold. Such gas injection nozzles are typically located near the plastic injection nozzle so that the gas injected can best assist the flow of the plastic material throughout its flow through the mold. This however typically subjects the gas injection nozzles to the flow of molten plastic at its most liquid state and highest pressure, which tends to clog or pack air injection nozzles. Further, gas injection nozzles are typically used as gas exhaust outlets, so that any molten material will tend to flow toward and into the outlet during the venting process. Cycle time of the molding process is critical to production cost, so venting before the interior of the part has completely cooled may be desirable, creating the potential condition for uncooled material flow

00114-00004-043303-055560

toward the gas nozzle. To inhibit the flow of molten resin into the gas nozzle, two approaches have typically been used: a valved fluid nozzle (i.e. U.S. Patent No. 5,232,711), or to use an injection pin with very small orifices which tend to resist the flow of the molten resin (i.e. U.S. Patent No. 5,820,889). Another method employed to avoid the clogging of the gas supply passages with molten resin is to delay gas injection until the plastic injection is completed, as described in U.S. Patent No. 5,295,800. However, this allows the plastic to cool somewhat, which reduces the flowability of the material, and reduces the efficacy and efficiency of the gas injection process.

The use of valved gas nozzles adds complexity and expense to the entire system. Injection molding is a relatively high production process, so such nozzles are subjected to repeated exposure to molten resin under pressure, which inevitably leads to the intrusion of resin into the inlet. A valved nozzle requires a reciprocating motion opposing the intrusion of plastic or overcoming the gas injection pressure, a motion that requires a relatively large force which may lead to wear and failure. Since repairing or replacing such reciprocating nozzles or valves is time consuming and expensive in material cost and in down time, it is necessary to have a heavy duty but simple device. Examples of prior art reciprocating nozzles or pins are shown in U.S. Patent Nos. 4,740,150; 4,905,901; 5,151,278; 5,164,200; 5,198,238 and 5,464,342.

### **Description of Preferred Embodiment**

The present invention is a gas injection nozzle pin assembly for a gas assisted plastic injection molding system as shown in the attached Figure 1. The assembly 10 generally comprises a nozzle having a gas inlet port which communicates with a stored gas which is used to control the metering and flow of the gas into the nozzle. The nozzle includes a generally cylindrical body

member 12. Extending from the body member on one end thereof is a pin member 14 containing an elongated cylindrical bore 16. The cylindrical bore has a conical nozzle end 18 which is used to mate with and accept an automatically controlled rod 20. The rod extends along the entire length of the cylindrical bore and into the body member of the nozzle assembly. The rod includes a frustoconical shape 22 on its end such that it mates with the conical nozzle end 18 of the cylindrical bore 16 to create a specific outlet size for gas escaping into the interior of the mold assembly.

The rod is controlled by the use of an electromagnetic solenoid 24 or other type of electronic actuator which will use electrical power to control movement of the rod in and out of the conical nozzle end, based on a sequence of events occurring in the molding operation. The electronic actuator is located within the body of the nozzle assembly and is securely connected to one end of the rod. The electronic actuator is controlled via an electronic control assembly which is attached to the control unit for the gas assisted injection molding assembly. The electronic actuator is activated by introducing current through an electromagnetic coil which is attracted to magnetically conductive metal at an end of the body 12. Additional electromagnetic inserts are preferably located at each end of the body 12 to increase the magnetic attractive forces, and to increase the return force when deactivated. It is preferred to have the device magnetically biased toward the closed position. A coil spring can also be utilized to bias the mechanism toward the closed position.

An alternate embodiment, not shown, includes a pneumatically controlled actuator for reciprocating the rod. Still another embodiment includes a ball screw drive for driving the rod, which is provided with a threaded end.

The use of the electronically controlled rod will allow the operation of the valve at precise intervals during the plastic injection in the mold such that flow-back does not occur within the

cylindrical nozzle bore member. The ease of the operation of the electronic pin will also allow for quicker reaction times to an overflow condition that might occur in the nozzle of the cylindrical bore member. Furthermore, the use of the electronically controlled actuating rod will allow for a closed pin while injecting resin and an open large end to pass fluid when cleaning of the nozzle is necessary.

It should be noted that the embodiment disclosed above uses an electronic actuator to control the movement of the rod thus releasing gas during various stages of the gas assisted plastic injection molding operation. It will allow for various amounts of gas to be released depending on the size of the outlet opening created at the nozzle end by actuated movement of the rod in the chamber. It should be noted that any other type of electronic or mechanical switch that can be electronically controlled by the operator or a computer system may be used in controlling the movement of the rod within the nozzle assembly.

#### **WHAT IS CLAIMED IS:**

1. A nozzle for the injection of fluid into a molding chamber comprising:
  - a hollow passage having a distal end for connecting a pressurized fluid supply to the interior of said chamber; and
  - a pin extending through said passage and reciprocal between an extended position and a retracted position, said pin having an enlarged distal portion extending beyond the distal end of said passage and substantially blocking said passage when said pin is in its retracted position.

2. The nozzle of claim 1 wherein said passage has a tapered inner diameter at its distal end and said enlarged portion of said pin has a substantially mating tapered contour.

3. The nozzle of claim 1 wherein said pin is hydraulically reciprocated.

4. The nozzle of claim 1 wherein said pin is reciprocated by an electromagnetic actuator.

5. The nozzle of claim 1 further comprising means for biasing said pin into said retracted position.

6. The nozzle of claim 1 further comprising a ball screw drive for reciprocating said pin.

7. A gas assisted injection molding apparatus comprising:

- a molding chamber;
- a supply of pressurized gas;
- a hollow conduit communicating with said gas supply and extending into said chamber;
- a pin extending through said conduit and reciprocal between an extended position and a retracted position, said pin having an enlarged distal portion which substantially closes said conduit when said pin is in said retracted position; and
- an electronic actuator reciprocating said pin.

8. The apparatus of claim 7, further comprising an electronic controller connected to said electronic actuator for controlling reciprocation of said pin.

9. The apparatus of claim 7, further comprising means for biasing said pin in said retracted position.

10. The nozzle of claim 7 wherein said conduit has a tapered inner diameter at its distal end and said enlarged portion of said pin has a substantially mating tapered contour.

0330704000

A hand-drawn schematic diagram of a gas inlet system. The diagram shows a rectangular housing (10) with a gas inlet (12) at the bottom. Inside the housing is a rectangular component (24) with diagonal hatching. A horizontal tube (14) extends from the component (24) to the right, passing through a seal or gasket (22). The tube (14) is connected to a vertical pipe (16) at its right end. The vertical pipe (16) has a flange or fitting (18) at its top. A curved line (20) is shown on the left side of the housing (10). The text "GAS INLET" with an arrow points to the inlet (12).

FIG. 1

Docket No.  
0114-00004

# Declaration and Power of Attorney For Patent Application

## English Language Declaration

As a below named inventor, I hereby declare that:

My residence, post office address and citizenship are as stated below next to my name,

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled

**Automated Pin For Gas Assisted Injection Molding System**

the specification of which

(check one)

☒ is attached hereto.

☐ was filed on \_\_\_\_\_ as United States Application No. or PCT International Application Number \_\_\_\_\_ and was amended on \_\_\_\_\_ (if applicable)

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose to the United States Patent and Trademark Office all information known to me to be material to patentability as defined in Title 37, Code of Federal Regulations, Section 1.56.

I hereby claim foreign priority benefits under Title 35, United States Code, Section 119(a)-(d) or Section 365(b) of any foreign application(s) for patent or inventor's certificate, or Section 365(a) of any PCT International application which designated at least one country other than the United States, listed below and have also identified below, by checking the box, any foreign application for patent or inventor's certificate or PCT International application having a filing date before that of the application on which priority is claimed.

Prior Foreign Application(s)

Priority Not Claimed

(Number)

(Country)

(Day/Month/Year Filed)

☐

(Number)

(Country)

(Day/Month/Year Filed)

☐

(Number)

(Country)

(Day/Month/Year Filed)

☐



I hereby claim the benefit under 35 U.S.C. Section 119(e) of any United States provisional application(s) listed below:

60/130,835

4/22/99

(Application Serial No.)

(Filing Date)

(Application Serial No.)

(Filing Date)

(Application Serial No.)

(Filing Date)

I hereby claim the benefit under 35 U. S. C. Section 120 of any United States application(s), or Section 365(c) of any PCT International application designating the United States, listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States or PCT International application in the manner provided by the first paragraph of 35 U.S.C. Section 112, I acknowledge the duty to disclose to the United States Patent and Trademark Office all information known to me to be material to patentability as defined in Title 37, C. F. R., Section 1.56 which became available between the filing date of the prior application and the national or PCT International filing date of this application:

(Application Serial No.)

(Filing Date)

(Status)  
(patented, pending, abandoned)

(Application Serial No.)

(Filing Date)

(Status)  
(patented, pending, abandoned)

(Application Serial No.)

(Filing Date)

(Status)  
(patented, pending, abandoned)

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

POWER OF ATTORNEY: As a named inventor, I hereby appoint the following attorney(s) and/or agent(s) to prosecute this application and transact all business in the Patent and Trademark Office connected therewith. *(list name and registration number)*

**Robert A. Dunn (Reg. No. 30,556)**

Send Correspondence to: **Robert A. Dunn**  
**Dinnin & Dunn, P.C.**  
**755 West Big Beaver, Ste. 2100**  
**Troy, MI 48084**

Direct Telephone Calls to: *(name and telephone number)*  
**(248) 362-2800 - Robert A. Dunn**

Full name of sole or first inventor

**Ronald Thomas**

Sole or first inventor's signature

Date

Residence

**35040 Renfrew, Apt. 308, Harrison Twp., MI 48045**

Citizenship

**USA**

Post Office Address

**35040 Renfrew, Apt. 308, Harrison Twp., MI 48045**

Full name of second inventor, if any

Second inventor's signature

Date

Residence

Citizenship

Post Office Address